STUDIES TO INVESTIGATE THE EFFECT OF PLANT GROWTH REGULATORS, CARBON SOURCES AND MEDIA MODIFICATION ON *IN VITRO* SEED GERMINATION AND CALLOGENESIS IN TOMATO

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to my mother Badriyah Hamad and father Muhammad Hamad Ameen, all my sisters, brothers, and friends.

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ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.) is a major vegetable crop that has achieved tremendous popularity over the last century. However, its production faced many problems like diseases, therefore, establishing a good protocol to improve the quantity and the quality of the crops is a prerequisite nowadays. Moreover, tissue culture has provided rapid modes to develop desirable varieties of cultivated plant species. In this study, *in vitro* culture response was assessed in tomato (*Lycopersicon esculentum* Mill. c.v. King Stone) for *in vitro* germination and optimum callus induction. The highest germination frequency (84.44%) was obtained on MS media (maltose as carbon source). In addition, to optimize an efficient protocol for callus induction, MS medium were supplemented with different source of carbon (sucrose and maltose) and different concentration of 2,4-D (0, 0.25, 0.5, 0.75, 1) mg/l in combination with BAP 1.5 mg/l and GA3 0.5 mg/l. In cotyledon explants the highest response of callus induction frequency (81.25%) and callus induction rate (3.25) were in MS media, which was supplemented with sucrose as carbon source and plant growth regulators 2,4-D 0 mg/l, BAP 1.5 mg/l and GA_3 0.5 mg/l (T1). while the maximum callus induction frequency (100%), callus induction rate (4.54) and explant productivity (17.32%) were obtained from hypocotyl explants which cultured on MS media in T1. In conclusion, maximum *in vitro* seed germination was observed on MS medium supplemented with maltose. While sucrose shows a significant role in callus induction. Callus induction was observed in both hypocotyl and cotyledon explants. Hypocotyls showed to be better explants for callogenesis. Maximum callogenesis was noted on MS medium supplemented with 2,4-D (0 mg/l), BAP (1.5 mg/l), GA_3 (0.5 mg/l).

ABSTRAK

Lycopersicon esculentum Mill. atau dikenali sebagai tomato merupakan hasil tanaman dan sayuran yang paling meluas akhir ini. Oleh kerana tomato penting dalam ekonomi, penanamannya semakin meningkat setiap hari. Namun begitu, penghasilannya menghadapi masalah seperti serangan penyakit. Oleh itu, teknik yang bersesuaian perlu diwujudkan untuk meningkatkan kualiti dan kuantiti tanaman. Tambahan pula, tisu kultur telah menyediakan cara yang pantas bagi menghasilkan variati tanaman yang diingini. Dalam kajian ini, tindakbalas *in vitro* untuk percambahan dan penghasilan kalus secara optimum ke atas tomato tomato (*Lycopersicon esculentum* Mill. c. v. King Stone) telah dikaji. Percambahan tertinggi (84.44%) telah diperolehi di atas media MS (maltosa sebagai sumber karbon). Untuk mengoptimumkan penghasilan kalus, MS media telah ditambah dengan sumber karbon yang berbeza (sukrosa dan maltosa) dan hormon 2,4-D dengan kepekatan yang berbeza (0, 0.25, 0.5, 0.75, dan 1 mg/l) dengan kombinasi 1.5 mg/l BAP dan 0.5 mg/l GA_3. Frekuensi kalus yang tertinggi (81.25%) dan kadar penghasilan kalus (3.25) untuk eksplan kotiledon telah diperolehi atas media MS yang ditambah dengan sukrosa sebagai sumber karbon dan hormon 2,4-D (0 mg/l), BAP (1.5 mg/l) and GA_3 (0.5 mg/l) (T1), manakala frekuensi penghasilan kalus yang maksimum (100%), kadar penghasilan kalus (4.54) dan penghasilan eksplan (17.32%) diperolehi daripada eksplan hipokotil yang dikultur atas media MS T1. Kesimpulannya, hasil pemerhatian menunjukkan percambahan biji benih secara in vitro yang maksimum adalah di dalam media MS dengan penambahan maltosa, manakala sukrosa berperanan penting dalam penghasilan kalus. Penghasilan kalus dapat diperhatikan pada eksplan hipokotil dan kotiledon. Hipokotil didapati eksplan yang lebih berpotensi untuk penghasilan kalus. Penghasilan kalus yang paling maksimum dicatat pada media MS dengan penambahan 2,4-D (0 mg/l), BAP (15 mg/l), GA_3 (0.5 mg/l).